Calculus

Date:

Items Needed: .Book, solving for points of inflection handout.

Objective: The students will determine what concavity is, what points of inflection are, and how to use the second derivative test.

Lesson:

- Graph $f(x) = \frac{1}{3}x^3 - x$ and its derivative.
- Graph on the board. (Do you remember how to graph by hand?)
- Draw a concave up diagram and follow with a concave down diagram and discuss the tangent lines to each of them.
- Concave up – f' is increasing, concave down – f' is decreasing
- Look at your graphs of the original function, at what interval is the original function concave down? On f' look at the interval for which it is decreasing and vice versa.
- To find the open intervals on which the graph of a function f is concave upward or downward, you need to find the intervals on which f' is increasing or decreasing.

- How do we check whether a function is increasing or decreasing? Find f'(x)> or < 0.
- Since concavity is directly relate to whether the f'(x) is increasing or decreasing, we must find whether f'(x) is increasing or decreasing.
- By taking the derivative of f'(x) and comparing it to zero, we can determine increasing or decreasing.
- Thus we get theorem 3-7. If f''(x) >0 for all x in I, then the graph of f is concave upward in I. If f''(x)<0 for all x in I, then the graph of f is concave downward in I.
- Do example 1.
- Look at example 2 but point out that in the first example it was continuous on the entire real line. If there are x-values at which the function is not continuous, these values should be used along with the points at which f''(x)=0 or is undefined to form the test intervals.

- Points of inflection – two points at which the concavity changes. If the tangent line to the graph exists at such a point, that point is a point of inflection. Refer to fig. 3.28
- Look at example 3 and point out figure 3.29.

- Define the second derivative test.
- Do example 4

Assignment: Have students do 2, 3, 11, 16, 21, 23, 28, 29, 31, 37, 41, 42, 44, 47, 53, 64, 67, 75, 87, p. 242.

Evaluation: (Could be from any one/several of the following)

Responses from classroom questions
Results of classroom sample problems
Homework responses
Check answer with Calculator
End of the section exam

Enrichment: